

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A packet communication system comprising:

a plurality of terminal equipments that conduct communication operation at periodic timing; and

relay equipments that relay packets transmitted between said terminal equipments, wherein synchronization control packets for timing synchronization are transmitted between adjacent equipments to thereby establish synchronization of operation timing,

wherein each of said terminal equipments and at least one of the relay equipments ~~including,~~ include:

_____a synchronization request unit which transmits a synchronization request packet to an adjacent equipment ~~at own operation~~ according to an internal synchronization timing and thereby performs a synchronization request;

_____a synchronization response unit which is responsive to acceptance of a synchronization request packet from said adjacent equipment, for transmitting a synchronization response packet corresponding to the synchronization request packet according to ~~own~~ the internal synchronization timing and thereby conducting a synchronization response;

_____a calculation unit which calculates a synchronization deviation value with respect to an adjacent equipment on the basis of ~~a time difference between~~ an arrival time of the synchronization response packet transmitted from said adjacent equipment ~~and own operation~~ relative to the internal synchronization timing; and

_____ a correction unit which corrects ~~operation~~ the internal synchronization timing of ~~the own equipment~~ on the basis of the synchronization deviation value calculated by said calculation unit.

2. (Currently Amended) The packet communication system according to claim 1, wherein each of said terminal equipments comprises an information packet transmission unit which transmits information packets having a number and a length predetermined for each terminal equipment toward an opposite terminal equipment in the wake of the synchronization request or response, and each of said relay equipments comprises a storage unit which temporarily stores information packets received between ~~the~~ a current operation timing and a next operation timing; and a relay unit which relays information packets stored in said storage unit in the wake of the synchronization request or response packet at the next operation timing.

3. (Currently Amended) The packet communication system according to claim 2, wherein each of said relay equipments further comprises

an extraction unit which extracts only data portions of information packets received between the current operation timing and the next operation timing, when relaying information packets from an N-N-side route of a 1:N ~~multiplexing and broadcasting~~ multiplexing-and-broadcasting communication system to a 1-1-side route; and a packet generation unit which generates packets having data portions extracted by said extraction unit and arranged in a predetermined order, and

said relay unit relays packets generated by said packet generation unit in the wake of the synchronization request or response packet at the next operation timing.

4. (Currently Amended) The packet communication system according to claim 1, wherein, based on operation of the respective correction units, said terminal equipments and relay equipments have ~~a~~ the same internal synchronization timing in which a sequential index number that increases by 1 every is assigned to each operation timing according to timing synchronization control, and each of said terminal equipments transmits packets having a number and a length predetermined for each terminal equipment toward an opposite terminal equipment in the wake of the synchronization request or response at the operation timing specified by a ~~synchronization timing~~ an index number predetermined for each terminal equipment.

5. (Original) The packet communication system according to claim 1, wherein each of said terminal equipments and relay equipments transmits an equipment management packet for notification and collection of failure information and update of initial setting parameters and operation programs of respective equipments, toward an adjacent equipment in the wake of the synchronization request or response packet according to a length and a number predetermined for each of said terminal equipments and relay equipment.

6. (Currently Amended) The packet communication system according to claim 1, wherein: each

_____ at least one of said terminal equipments has packets of best effort type that are retransmitted by a communication procedure of a higher order layer, even if said packets have been discarded because of system congestion, as nonpreferential information packets;

_____ when there is a time for transmitting information packets of a maximum length in an interval between transmission of an information packet and a next operation timing, ~~each of the~~ at least one of said terminal equipments transmits said nonpreferential information packets; and

_____ when there is a time required for transmission of information packets of a maximum length in an interval between relay and a next operation timing, each of said relay equipments relays said nonpreferential information packets.

7. (Currently Amended) The packet communication system according to claim 1, wherein each of said relay equipments further comprises a detection unit which detects an error of a timing synchronization procedure or an excess of the number of information packets between said relay equipment and an adjacent equipment; and a relay ~~stopping~~ stopping unit which is responsive to detection of an error of a timing synchronization procedure or an excess of the number of information packets conducted by said detection unit, for stopping the relay of information packets until said error of a timing synchronization procedure or excess of the number of information packets is canceled.

8. (Currently Amended) A packet communication method applicable to a packet communication system, said packet communication system including a plurality of terminal equipments that conduct communication operation at periodic timing; and relay equipments that relay packets

transmitted between said terminal equipments, wherein synchronization control packets for timing synchronization are transmitted between adjacent equipments to thereby establish synchronization of operation timing, the packet communication method comprising:

~~a synchronization request step at which~~ each of said terminal equipments and relay equipments, ~~transmits~~ transmitting a synchronization request packet to an adjacent equipment at ~~own operation~~ according to an internal synchronization timing and thereby conducting a synchronization request;

~~a synchronization response step at which,~~ at each of said terminal equipments and relay equipments, in response to acceptance of a synchronization request packet from said adjacent equipment, ~~each of said terminal equipments and relay equipments transmits~~ transmitting a synchronization response packet corresponding to the synchronization request packet according to ~~own~~ the internal synchronization timing, ~~and thereby conducts~~ conducting a synchronization response;

~~a calculation step at which~~ each of said terminal equipments and relay equipments, ~~calculates~~ calculating a synchronization deviation value with respect to an adjacent equipment on the basis of ~~a time difference between~~ an arrival time of the synchronization response packet transmitted from said adjacent equipment ~~and own operation~~ relative to the internal synchronization timing; and

~~a correction step at which~~ each of said terminal equipments and relay equipments, ~~corrects operation~~ correcting the internal synchronization timing of ~~the own equipment~~ on the basis of the calculated synchronization deviation value ~~calculated at the calculation step~~.

9. (Currently Amended) The packet communication method according to claim 8, further comprising:

~~an information packet transmission step at which each of said terminal equipments,~~
~~transmits-transmitting~~ information packets having a number and a length predetermined for each terminal equipment toward an opposite terminal equipment in the wake of the synchronization request or response; and

~~a relay step at which each of said relay equipments, temporarily stores-storing~~
information packets received between ~~the~~a current operation timing and a next operation timing, and ~~relays-relaying~~ information packets temporarily stored in said storage unit in the wake of the synchronization request or response packet at the next operation timing.

10. (Currently Amended) The packet communication method according to claim 9, further comprising: ~~an extraction step~~

~~_____ at which each of said relay equipments, extracts-extracting only~~ data portions of information packets received between the current operation timing and the next operation timing, when relaying information packets from an N-N-side route of a 1:N ~~multiplexing-and-broadcasting-multiplexing-and-broadcasting~~ communication system to a 1-1-side route; and a ~~packet generation step~~

~~_____ at which each of said relay equipments, generate-generating~~ packets having data portions extracted at said extraction step and arranged in a predetermined order, wherein and

at the relaying step, packets generated at the packet generation step are relayed in the wake of the synchronization request or response packet at the next operation timing.

11. (Currently Amended) The packet communication method according to claim 8, wherein, based on said correcting step, said terminal equipments and relay equipments have ~~a~~the same internal synchronization timing in which a sequential index number that increases by 1 every is assigned to each operation timing according to timing synchronization control, and each of said terminal equipments transmits packets having a number and a length predetermined for each terminal equipment toward an opposite terminal equipment in the wake of the synchronization request or response at the operation timing specified by ~~a synchronization timing~~ an index number predetermined for each terminal equipment.

12. (Original) The packet communication method according to claim 8, wherein each of said terminal equipments and relay equipments transmits an equipment management packet for notification and collection of failure information and update of initial setting parameters and operation programs of respective equipments, toward an adjacent equipment in the wake of the synchronization request or response packet according to a length and a number predetermined for each of said terminal equipments and relay equipment.

13. (Currently Amended) The packet communication method according to claim 8, wherein: ~~each~~

at least one of said terminal equipments has packets of best effort type that are retransmitted by a communication procedure of a higher order layer, even if said packets have been discarded because of system congestion, as nonpreferential information packets;

_____ when there is a time for transmitting information packets of a maximum length in an interval between transmission of an information packet and next operation timing, ~~each of the at~~ least one of said terminal equipments transmits said nonpreferential information packets toward opposite terminal equipment; and

_____ when there is a time required for transmission of information packets of a maximum length in an interval between relay and a next operation timing, each of said relay equipments relays said nonpreferential information packets.

14. (Currently Amended) The packet communication method according to claim 8, wherein ~~further comprising:~~

_____ ~~a detection step at which~~ each of said relay equipments is configured to detects an error of a timing synchronization procedure or an excess of the number of information packets between said relay equipment and an adjacent equipment; and

~~a relay stop step at which,~~ in response to detection of an error of a timing synchronization procedure or an excess of the number of information packets at said detection step, each of said relay equipments stops the relay of information packets until said error of a timing synchronization procedure or excess of the number of information packets is canceled.

15. (Currently Amended) A computer readable recording medium wherein a packet communication method of a packet communication system is recorded thereon as a computer program for making a computer execute a packet communication method applicable to a packet communication system, said packet communication system including a plurality of terminal

equipments that conduct communication operation at periodic timing; and relay equipments that relay packets transmitted between said terminal equipments, wherein synchronization control packets for timing synchronization are transmitted between adjacent equipments to thereby establish synchronization of operation timing, the packet communication method comprising:

~~a synchronization request step at which each of said terminal equipments and relay equipments, transmits~~ transmitting a synchronization request packet to an adjacent equipment at ~~own operation according to an internal synchronization~~ timing and thereby conducting a synchronization request;

~~a synchronization response step at which, at each of said terminal equipments and relay equipments,~~ in response to acceptance of a synchronization request packet from said adjacent equipment, ~~each of said terminal equipments and relay equipments transmits~~ transmitting a synchronization response packet corresponding to the synchronization request packet according to ~~own the internal~~ synchronization timing and thereby ~~conducts~~ conducting a synchronization response;

~~a calculation step at which each of said terminal equipments and relay equipments, calculates~~ calculating a synchronization deviation value with respect to an adjacent equipment on the basis of ~~a time difference between an arrival time of the synchronization response packet transmitted from said adjacent equipment and own operation~~ relative to the internal synchronization timing; and

~~a correction step at which each of said terminal equipments and relay equipments, corrects operation~~ correcting the internal synchronization timing of the own equipment on the basis of the calculated synchronization deviation value ~~calculated at the calculation step~~.

16. (Currently Amended) A computer readable recording medium wherein a packet communication method of a packet communication system is recorded thereon as a computer program for making a computer execute a packet communication method applicable to a packet communication system, said packet communication system including a plurality of terminal equipments that conduct communication operation at periodic timing; and relay equipments that relay packets given and received between said terminal equipments, wherein synchronization control packets for timing synchronization are transmitted between adjacent equipments to thereby establish synchronization of operation timing, the packet communication method comprising:

a synchronization request step at which each of said terminal equipments and relay equipments transmits a synchronization request packet to an adjacent equipment at ~~own~~an operation timing ~~and according to an internal synchronization timing,~~ thereby conducting a synchronization request;

a synchronization response step at which, in response to acceptance of a synchronization request packet from said adjacent equipment, each of said terminal equipments and relay equipments transmits a synchronization response packet corresponding to the synchronization request packet according to ~~own~~the internal synchronization timing and thereby conducts a synchronization response;

a calculation step at which each of said terminal equipments and relay equipments calculates a synchronization deviation value with respect to an adjacent equipment on the basis of a time difference between an arrival time of the synchronization response packet transmitted

from said adjacent equipment and ~~own~~an operation timing of the internal synchronization timing; and

a correction step at which each of said terminal equipments and relay equipments corrects ~~operation~~the internal synchronization timing of the own equipment on the basis of the synchronization deviation value calculated at the calculation step;

an information packet transmission step at which each of said terminal equipments transmits information packets having a number and a length predetermined for each terminal equipment toward an opposite terminal equipment in the wake of the synchronization request packet; and

a relay step at which each of said relay equipments temporarily stores information packets received between ~~the~~a current operation timing and a next operation timing, and relays the temporarily stored information packets in the wake of the synchronization request packet at the next operation timing.

17. (Currently Amended) A computer readable recording medium wherein a packet communication method of a packet communication system is recorded thereon as a computer program for making a computer execute a packet communication method applicable to a packet communication system, said packet communication system including a plurality of terminal equipments that conduct communication operation at periodic timing; and relay equipments that relay packets given and received between said terminal equipments, wherein synchronization control packets for timing synchronization are transmitted between adjacent equipments to

thereby establish synchronization of operation timing, the packet communication method comprising:

a synchronization request step at which each of said terminal equipments and relay equipments transmits a synchronization request packet to an adjacent equipment at ~~own-an~~ operation timing and according to an internal synchronization timing, thereby conducting a synchronization request;

a synchronization response step at which, in response to acceptance of a synchronization request packet from said adjacent equipment, each of said terminal equipments and relay equipments transmits a synchronization response packet corresponding to the synchronization request packet according to ~~own-the internal~~ synchronization timing and thereby conducts a synchronization response;

a calculation step at which each of said terminal equipments and relay equipments calculates a synchronization deviation value with respect to an adjacent equipment on the basis of a time difference between an arrival time of the synchronization response packet transmitted from said adjacent equipment and ~~own-an~~ operation timing of the internal synchronization timing; and

a correction step at which each of said terminal equipments and relay equipments corrects ~~operation-the internal synchronization timing of the own equipment~~ on the basis of the synchronization deviation value calculated at the calculation step;

an information packet transmission step at which each of said terminal equipments transmits information packets having a number and a length predetermined for each terminal

equipment toward an opposite terminal equipment in the wake of the synchronization request packet; and

a relay step at which each of said relay equipments temporarily stores information packets received between ~~the~~ a current operation timing ~~and a~~ next operation timing, and relays the temporarily stored information packets in the wake of the synchronization request packet at the next operation timing;

an extraction step at which each of said relay equipments extracts only data portions of information packets received between current operation timing and next operation timing, when relaying information packets from an ~~N-N~~-side route of a 1:N ~~multiplexing and broadcasting~~ multiplexing-and-broadcasting communication system to a ~~1-1~~-side route; and

a packet generation step at which each of said relay equipments generate packets having data portions extracted at said extraction step and arranged in a predetermined order,

wherein, at the relay step, packets generated at the packet generation step being relayed in the wake of the synchronization request packet at next operation timing.

18. (New) The packet communication system according to claim 1, wherein the calculation unit calculates the synchronization deviation value on the basis of a time difference between: an arrival time of the synchronization response packet from the adjacent equipment, and an operation timing of the internal synchronization timing that immediately precedes the arrival time of the synchronization response packet.

19. (New) The packet communication method according to claim 8, wherein each of the terminal equipments and relay equipments calculates the synchronization deviation value on the basis of a time difference between: an arrival time of the synchronization response packet from the adjacent equipment, and an operation timing of the internal synchronization timing that immediately precedes the arrival time of the synchronization response packet.

20. (New) The computer readable recording medium according to claim 15, wherein each of the terminal equipments and relay equipments calculates the synchronization deviation value on the basis of a time difference between: an arrival time of the synchronization response packet from the adjacent equipment, and an operation timing of the internal synchronization timing that immediately precedes the arrival time of the synchronization response packet.